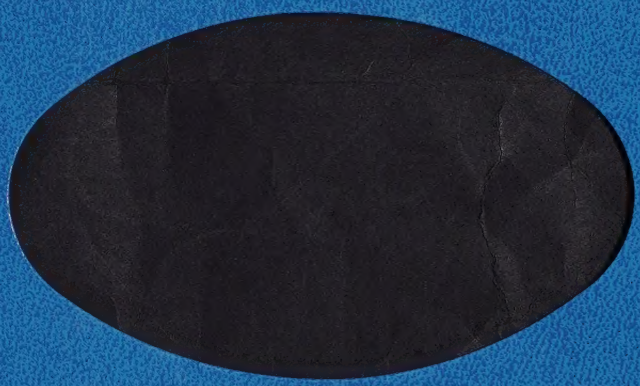

MP MASTER
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Scientific Atlanta

Instruction Manual

MODELS 68-12 and 68-12TS
COMBINING NETWORKS

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First Edition, November 1982

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SECTION 1
GENERAL DESCRIPTION

1.1 SCOPE

This instruction manual describes the features and functions of both the Model 68-12 and the Model 68-12TS Combining Network.

1.2 PURPOSE OF EQUIPMENT

Both Model 68-12 and Model 68-12TS Combining Networks provide the means to combine twelve separate signal sources, such as signal processors, modulators, and other associated combining networks into one output signal source.

1.3 DESCRIPTION

Both Model 68-12 and Model 68-12TS Combining Networks are passive circuits contained on a 19-inch wide by 3.5-inch high rack mount panel (see figure 1-1). The Model 68-12TS Combining Network provides four front panel and four rear panel test connectors that are not provided with the Model 68-12 Combining Network. These front panel connectors can be used for test connections, monitoring points, or as needed to satisfy a station or system configuration.

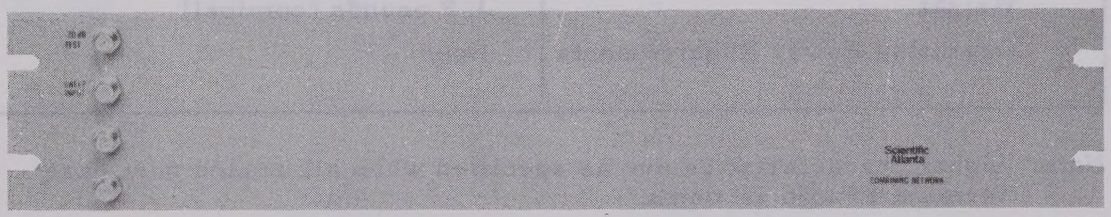

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Figure 1-1. A Typical Model 68-12 Combining Network Front Panel. (A Model 68-12TS is shown.)

1.4 TECHNICAL CHARACTERISTICS

The technical characteristics of both Model 68-12 and Model 68-12TS Combining Networks are summarized in table 1-1.

Table 1-1.
Model 68-12/68-12TS Combining Network
Technical Specifications

Feature	Characteristics (See Note)
Input Ports	Twelve
Input Port Impedance	75 ohms, unbalanced
Test Ports (Model 68-12TS only)	Four front panel and four rear panel, interconnected per system/station requirements.
Output Ports	One (Model 68-12) or two (Model 68-12TS)
Output Port Impedance	75 ohms, unbalanced
Input Return Loss (All ports)	≤-17 dB
Output Return Loss	≤-16 dB
Flatness (50 to 440 MHz)	±1.0 dB
Signal Loss	-20.5 (±2.5) dB
Isolation Between Ports	≥30 dB (Typical)
Sweep Input Flatness (Model 68-12TS only)	±0.5 dB
Test Input Flatness (Model 68-12TS only)	±0.5 dB
Size	19-inch W x 3.5-inch H x 0.5-inch D
Weight	1.8 pounds (nominal)
Operating Power Requirements	None

Note: Signal characteristics are as specified when all unused ports are terminated into 75 ohms.

SECTION 2
INSTALLATION

2.1 SCOPE

There are several ways of using the Model 68-12 Combining Network with the Model 68-12TS Combining Network to satisfy system requirements. For example, when a system has many channels to combine into one signal for distribution, several Model 68-12 Combining Network units and one Model 68-12TS Combining Network (for its test features) may be used to satisfy system requirements. In another system it may be desired to have all channels combined using several Model 68-12TS Combining Network units so that each channel group may be tested separately.

It is beyond the scope of this instruction manual to document all possible station configurations. Figures 2-1 and 2-2 identify the conventional use of the equipment cable connectors. These figures provide cabling references for reconnection if the equipment should ever be removed.

The nominal installation procedure requires mounting in a standard 19-inch wide rack using four rack screws through the slotted front panel. All signal connections are made using 75-ohm cable provided with Type F connectors. No operating power is required.

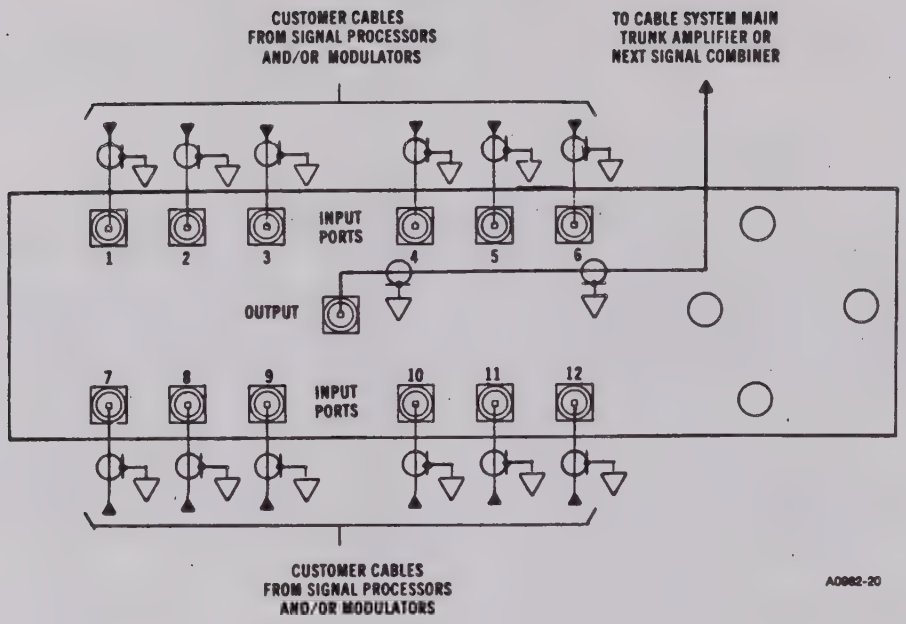

Figure 2-1. Suggested Cabling Using A Model 68-12 Combining Network

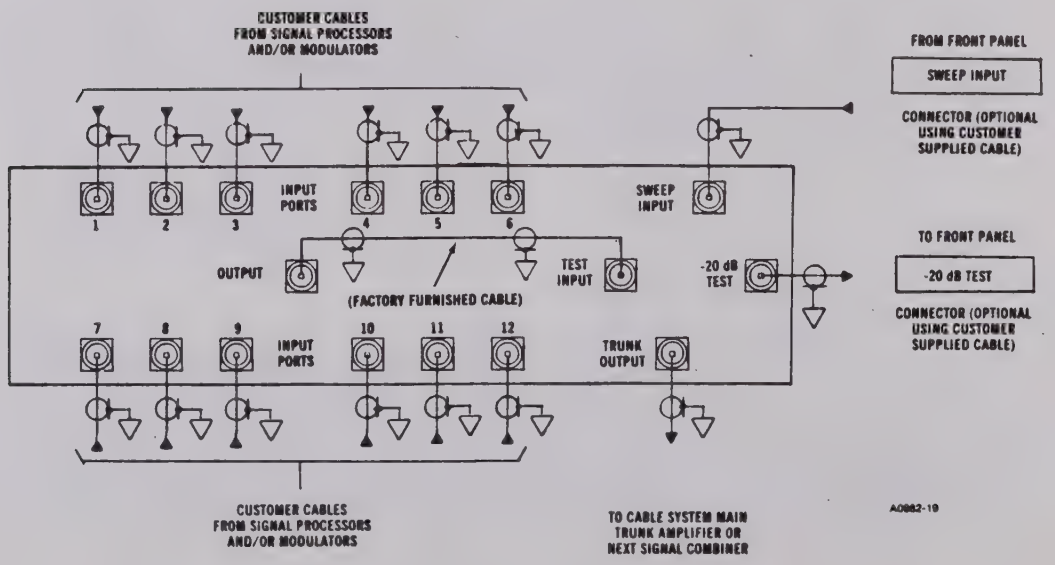

Figure 2-2. Suggested Cabling Using A Model 68-12TS Combining Network

SECTION 3
OPERATION

3.1 SCOPE

There are no operator controls provided on either Model 68-12 Combining Network or Model 68-12TS Combining Network. The Model 68-12TS Combining Network does provide four front panel connectors which may be cabled to rear panel test station connections or used in any way to satisfy system requirements.

SECTION 4
THEORY OF OPERATION

4.1 SCOPE

Both the Model 68-12 and the Model 68-12TS Combining Network will combine up to twelve input signals into one output signal. Figure 4-1 is a simplified diagram of the components and circuit arrangements of both models.

4.2 COMBINING PORTS

Both models of the combining network are identical from the "INPUT PORTS" to the port labeled "OUTPUT". This circuit arrangement consists of twelve broadband directional couplers and a four-way combiner.

All couplers are arranged on the printed wiring board for minimum mutual coupling. This arrangement also provides a typical isolation between input ports of ≥30 dB.

Figure 4-1 shows the twelve "INPUT PORTS" are broken into four strings of directional couplers using three couplers per string. Each string of couplers is summed together in a four-way combiner consisting of components T15 through T19 and variable capacitors C3 and C4.

Note

Variable capacitors C3 and C4 should not be adjusted in the field. They are set during manufacture checkout using special procedures with a network analyzer to achieve the maximum flatness versus return loss.

The output signal of the four-way combiner is applied across a resistive 3-dB pad (components R22, R23, and R24). The resultant signal is capacitively coupled through component C1 to connector J13 labeled "OUTPUT".

4.3 TEST PORTS

Test ports for injecting a sweep signal into the trunk output signal and for monitoring the combining network output signal are provided on the Model 68-12TS Combining Network. This portion of the circuitry consists of two directional couplers and a fixed attenuator. The first directional coupler (T13) is used to couple a signal applied to the "SWEEP INPUT" port into the main signal path. The second directional coupler (T14) provides a sample of the main signal to the output of the test section. This signal, which is 10 dB below the main signal level, is attenuated another 10 dB by the attenuator pad using resistors R19, R20, and R21. The reduced level of the main signal is applied to the "-20 dB TEST" port.

J1
T1
R1
R2
T7
J7
J4
T4
R3
R4
T10
J10

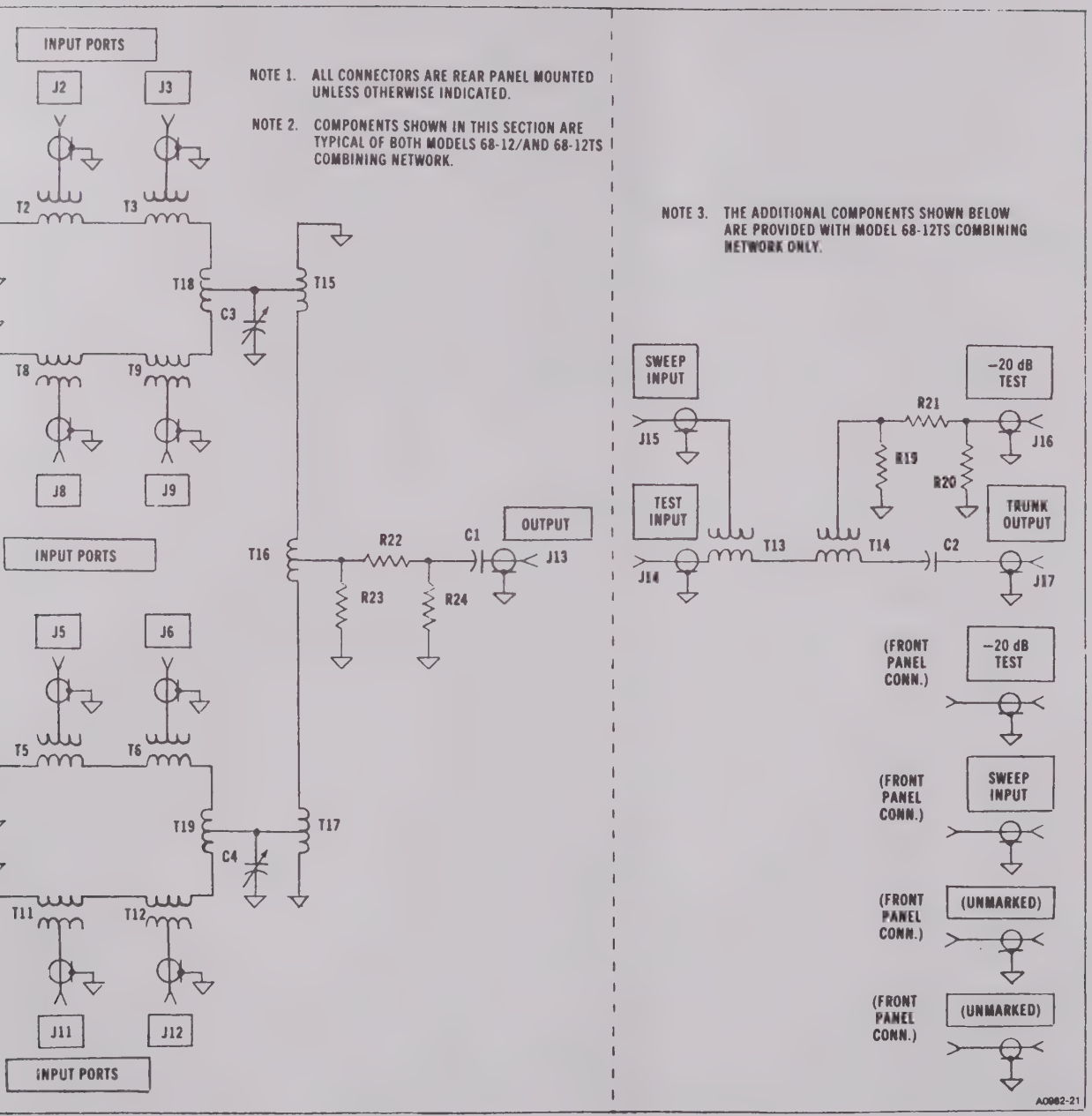

Figure 4-1. A Typical Model 68-12TS Combining Network, Simplified Diagram

SECTION 5
MAINTENANCE

5.1 SCOPE

Both Model 68-12 Combining Network and Model 68-12TS Combining Network are totally passive circuits and require no periodic maintenance. Figure 5-1 shows a typical rear panel view of the equipment. If the equipment is ever suspected of causing a system malfunction, it should be removed from service and bench tested.

Bench testing should be confined to terminating all unused ports with Type F 75-ohm terminations, injecting a test signal at an input port, and observing the signal at the "OUTPUT" connector (J13) to have identical characteristics at a nominal -20.5 (±2.5) dB signal level change.

A similar test can be used on the test port circuits of a Model 68-12TS Combining Network by injecting a known signal level to the "TEST INPUT" connector (J14) and observing the signal at the "TRUNK OUTPUT" connector (J17). Normal station test equipment can be used to verify circuit functions between the "SWEEP INPUT" connector (J15) and the "-20 dB TEST" connector (J16).

In normal headend service, this equipment should never require servicing.

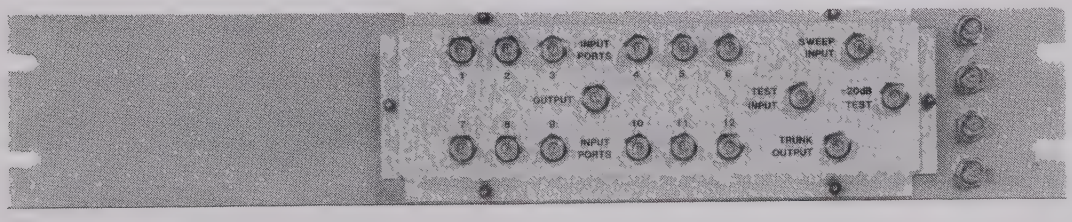

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Figure 5-1. A Typical Model 68-12 Combining Network Rear Panel. (A Model 68-12TS is shown.)

SECTION 6
PARTS LISTS

6.1 SCOPE

The parts lists in this section identify the electrical and electronic component numbers which should be used when ordering replacement and/or spare parts for the Models 68-12/68-12TS Combining Network. The REF DESIGNATION column provides reference to component designation as shown on schematic diagrams in section 7. The PART NO. column is also the Scientific-Atlanta ordering number. The DESCRIPTION column provides a brief physical description of the component.

When ordering parts from Scientific-Atlanta, please include the unit identification, (i.e., Model 68-12 Combining Network), the unit serial number, the unit assembly and/or subassembly name identification, the REF DESIGNATION (if applicable), the PART NO. and the DESCRIPTION. Component assemblies of the Models 68-12/68-12TS Combining Network are presented in the following sequence:

REF DESIGNATION	PART NO.	DESCRIPTION
	275017	Model 68-12 Combining Network
	275000	Model 68-12TS Combining Network

MODEL 68-12 COMBINING NETWORK - 275017

REF DESIGNATION	PART NO.	DESCRIPTION
	C275018	ASSY, PWB 68-12 COMBINING NETWORK
	C275002	PWB COMBINER
C 003	C087125	CAPACITR 3.3-18 PF MIN CER PC MT
C 004	C087125	CAPACITR 3.3-18 PF MIN CER PC MT
C0001	C070549	CAPACITR .0015 MF 1KV CER DISC Z5U GMV
J 001	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 002	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 003	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 004	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 005	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 006	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 007	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 008	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 009	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 010	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 011	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 012	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 013	C233600	CONNECTOR, TYPE "F" PC MOUNT
R 001	C170716	RESISTOR 75 OHM 1/8W 5%
R 002	C170716	RESISTOR 75 OHM 1/8W 5%
R 003	C170716	RESISTOR 75 OHM 1/8W 5%
R 004	C170716	RESISTOR 75 OHM 1/8W 5%
R 005	C170716	RESISTOR 75 OHM 1/8W 5%
R 006	C170716	RESISTOR 75 OHM 1/8W 5%
R 007	C170716	RESISTOR 75 OHM 1/8W 5%
R 008	C170716	RESISTOR 75 OHM 1/8W 5%
R 009	C170716	RESISTOR 75 OHM 1/8W 5%
R 010	C170716	RESISTOR 75 OHM 1/8W 5%
R 011	C170716	RESISTOR 75 OHM 1/8W 5%
R 012	C170716	RESISTOR 75 OHM 1/8W 5%
R 013	C170716	RESISTOR 75 OHM 1/8W 5%
R 014	C170716	RESISTOR 75 OHM 1/8W 5%
R 015	C170716	RESISTOR 75 OHM 1/8W 5%
R 016	C170716	RESISTOR 75 OHM 1/8W 5%
R 022	C078271	RESISTOR 27 OHM 1/8 WATT 5% COMP
R 023	C171760	RESISTOR 430 OHM 1/8 5% COMP
R 024	C171760	RESISTOR 430 OHM 1/8 5% COMP
T 001	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 002	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 003	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 004	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 005	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 006	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 007	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 008	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 009	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 010	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 011	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 012	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 015	C275009	RF TRANSFORMER
T 016	C275009	RF TRANSFORMER
T 017	C275009	RF TRANSFORMER
T 018	C275008	COMBINING TRANSFORMER
T 019	C275008	COMBINING TRANSFORMER

MODEL 68-12TS COMBINING NETWORK - 275000

REF DESIGNATION	PART NO.	DESCRIPTION
	C275001	ASSY. PWB-68-12TS COMBINING NETWORK
	C233819	CONNECTOR COAX F FEMALE DOUBLE D MT
	C275002	PWB COMBINER
C 001	C070549	CAPACITR .0015 MF 1KV CER DISC Z5U GMV
C 002	C070549	CAPACITR .0015 MF 1KV CER DISC Z5U GMV
C 003	C087125	CAPACITR 3.3-18 PF MIN CER PC MT
C 004	C087125	CAPACITR 3.3-18 PF MIN CER PC MT
J 001	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 002	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 003	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 004	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 005	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 006	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 007	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 008	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 009	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 010	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 011	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 012	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 013	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 014	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 015	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 016	C233600	CONNECTOR, TYPE "F" PC MOUNT
J 017	C233600	CONNECTOR, TYPE "F" PC MOUNT
R 001	C170716	RESISTOR 75 OHM 1/8W 5%
R 002	C170716	RESISTOR 75 OHM 1/8W 5%
R 003	C170716	RESISTOR 75 OHM 1/8W 5%
R 004	C170716	RESISTOR 75 OHM 1/8W 5%
R 005	C170716	RESISTOR 75 OHM 1/8W 5%
R 006	C170716	RESISTOR 75 OHM 1/8W 5%
R 007	C170716	RESISTOR 75 OHM 1/8W 5%
R 008	C170716	RESISTOR 75 OHM 1/8W 5%
R 009	C170716	RESISTOR 75 OHM 1/8W 5%
R 010	C170716	RESISTOR 75 OHM 1/8W 5%
R 011	C170716	RESISTOR 75 OHM 1/8W 5%
R 012	C170716	RESISTOR 75 OHM 1/8W 5%
R 013	C170716	RESISTOR 75 OHM 1/8W 5%
R 014	C170716	RESISTOR 75 OHM 1/8W 5%
R 015	C170716	RESISTOR 75 OHM 1/8W 5%
R 016	C170716	RESISTOR 75 OHM 1/8W 5%
R 017	C170716	RESISTOR 75 OHM 1/8W 5%
R 018	C170716	RESISTOR 75 OHM 1/8W 5%
R 019	C078058	RESISTOR 150 OHM 1/8W 5% COMP
R 020	C078058	RESISTOR 150 OHM 1/8W 5% COMP
R 021	C078056	RESISTOR 100 OHM 1/8W 5% COMP
R 022	C078271	RESISTOR 27 OHM 1/8 WATT 5% COMP
R 023	C171760	RESISTOR 430 OHM 1/8 5% COMP
R 024	C171760	RESISTOR 430 OHM 1/8 5% COMP
T 001	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 002	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 003	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 004	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 005	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 006	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 007	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 008	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 009	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 010	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 011	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 012	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 013	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 014	C035891	TRANSFORMER 1T, 3T: 3T, 1T
T 015	C275009	RF TRANSFORMER
T 016	C275009	RF TRANSFORMER
T 017	C275009	RF TRANSFORMER
T 018	C275008	COMBINING TRANSFORMER
T 019	C275008	COMBINING TRANSFORMER

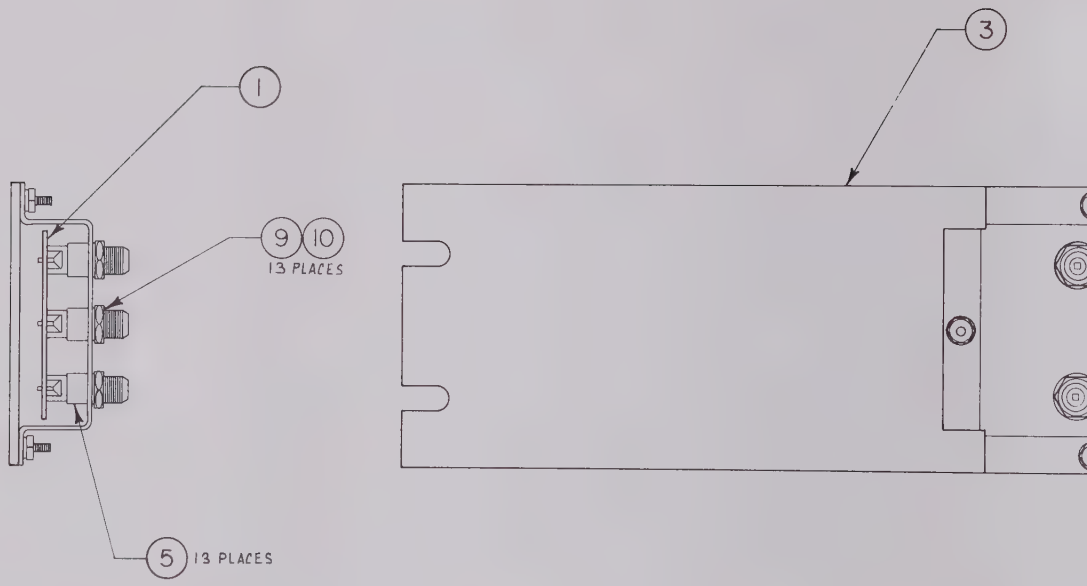
SECTION 7
DIAGRAMS

7.1 SCOPE

The diagrams contained in this section document both the Model 68-12 Combining Network and the Model 68-12TS Combining Network. The index lists the sequence of assembly and schematic diagrams for quick reference.

INDEX OF DIAGRAMS

Figure 7-1.	Model 68-12 Combining Network, Assembly Diagram
Figure 7-2.	Model 68-12 Combining Network, Printed Wiring Board, Component Location
Figure 7-3.	Model 68-12 Combining Network, Printed Wiring Board, Schematic Diagram
Figure 7-4.	Model 68-12TS Combining Network, Assembly Diagram
Figure 7-5.	Model 68-12TS Combining Network, Printed Wiring Board, Component Location
Figure 7-6.	Model 68-12TS Combining Network, Printed Wiring Board, Schematic Diagram



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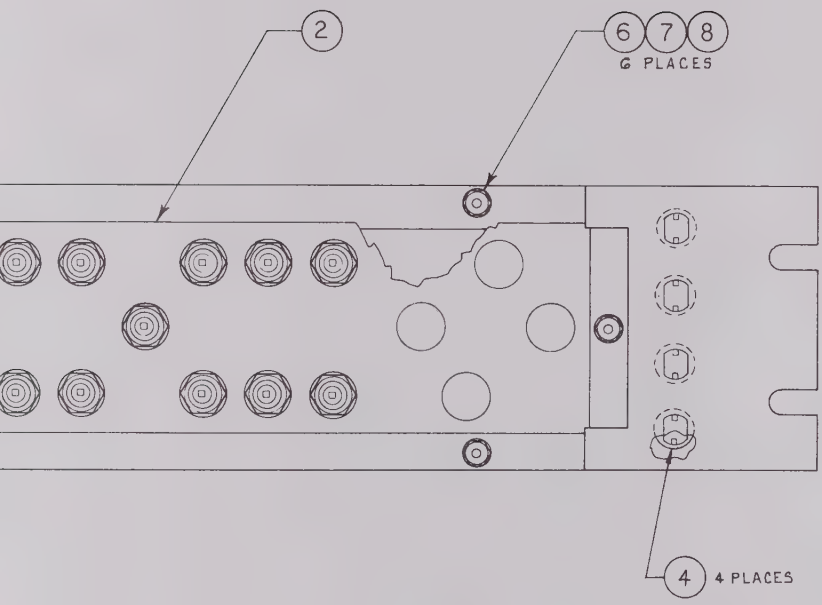
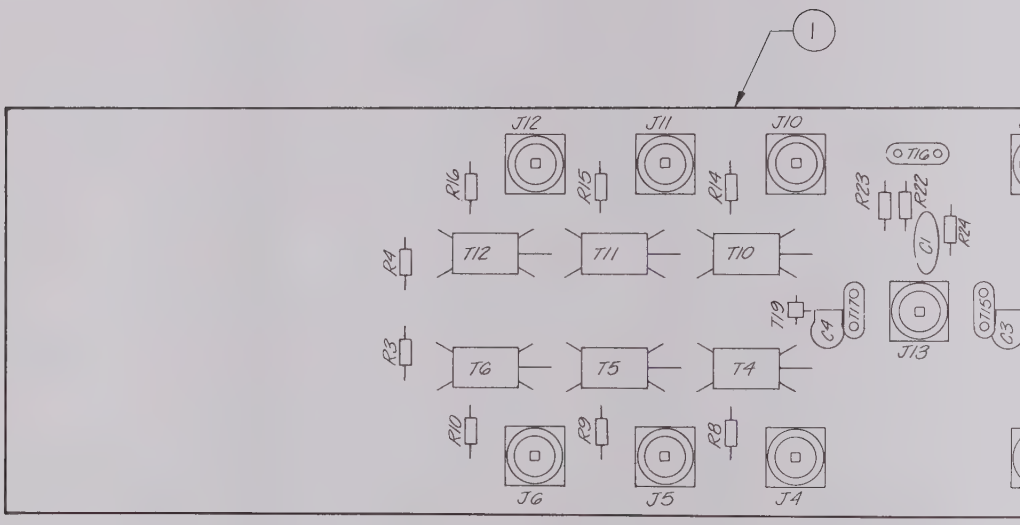


SEE SEPARATE PARTS LIST

Figure 7-1. Model 68-12 Combining Network, Assembly Diagram



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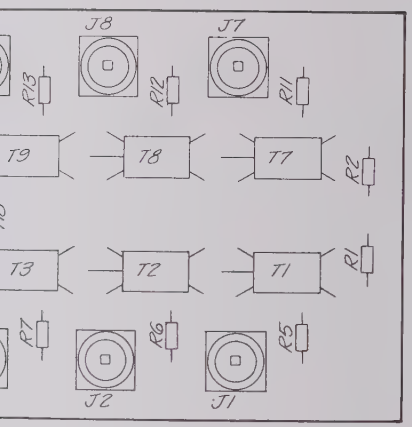
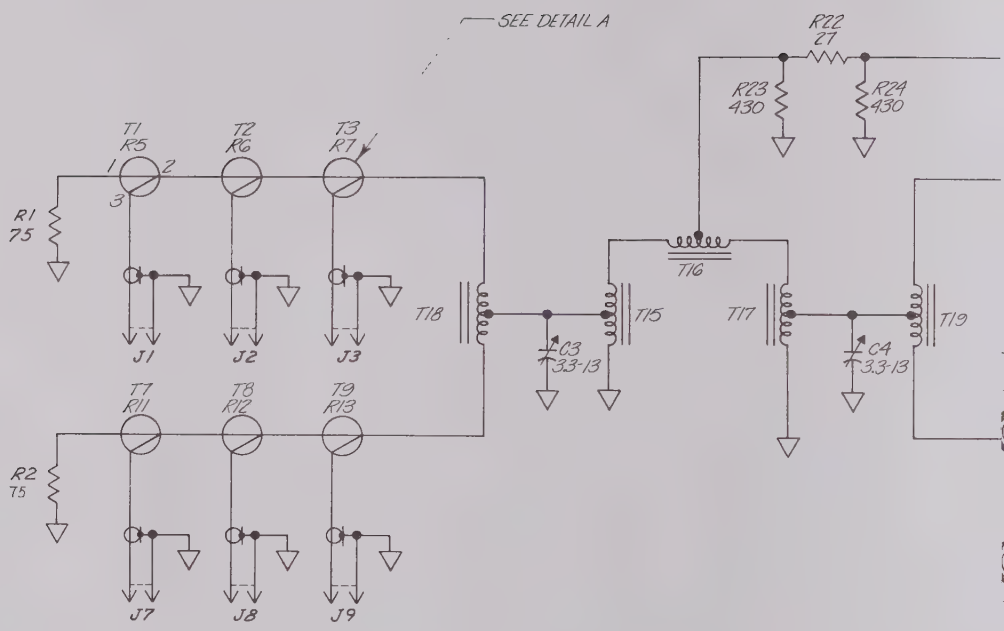
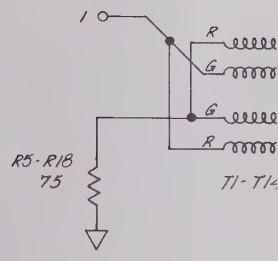


SEE SEPARATE PARTS LIST

Figure 7-2. Model 68-12 Combining Network, Printed Wiring Board, Component Location





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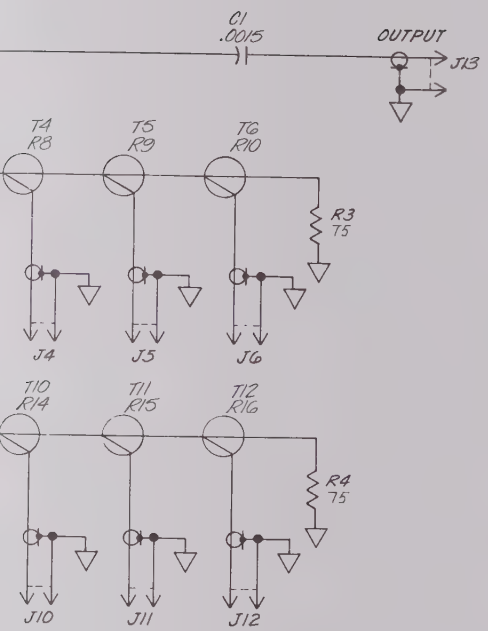


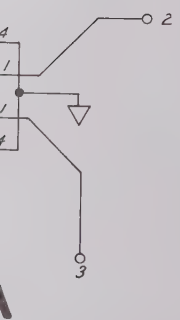
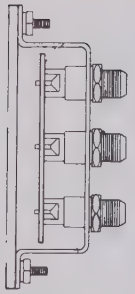
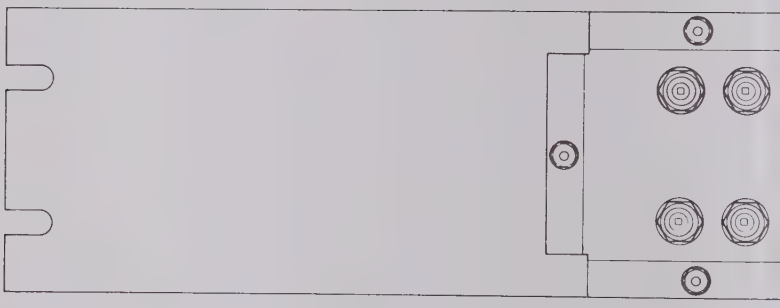


Figure 7-3. Model 68-12 Combining Network, Printed Wiring Board, Schematic Diagram





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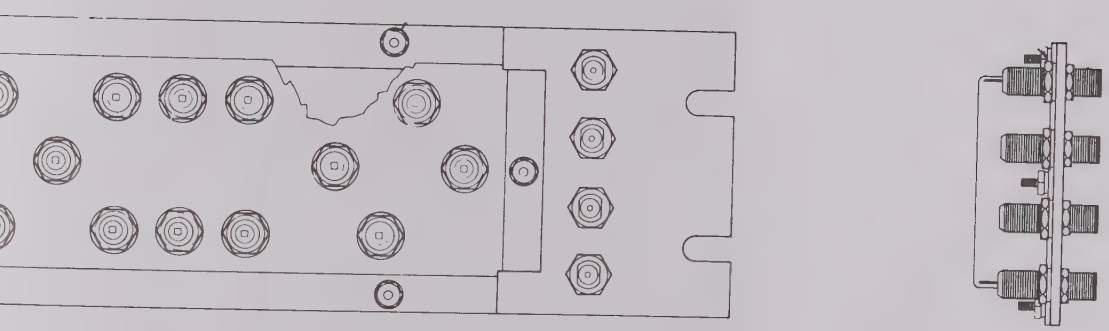
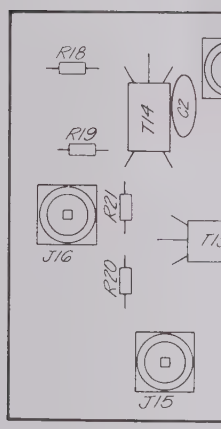


Figure 7-4. Model 68-12TS Combining Network, Assembly Diagram



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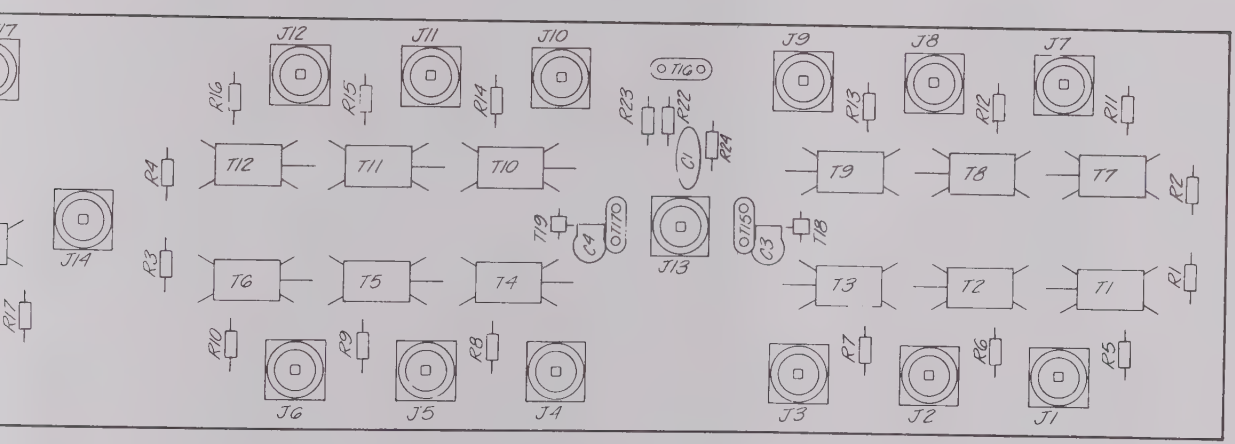
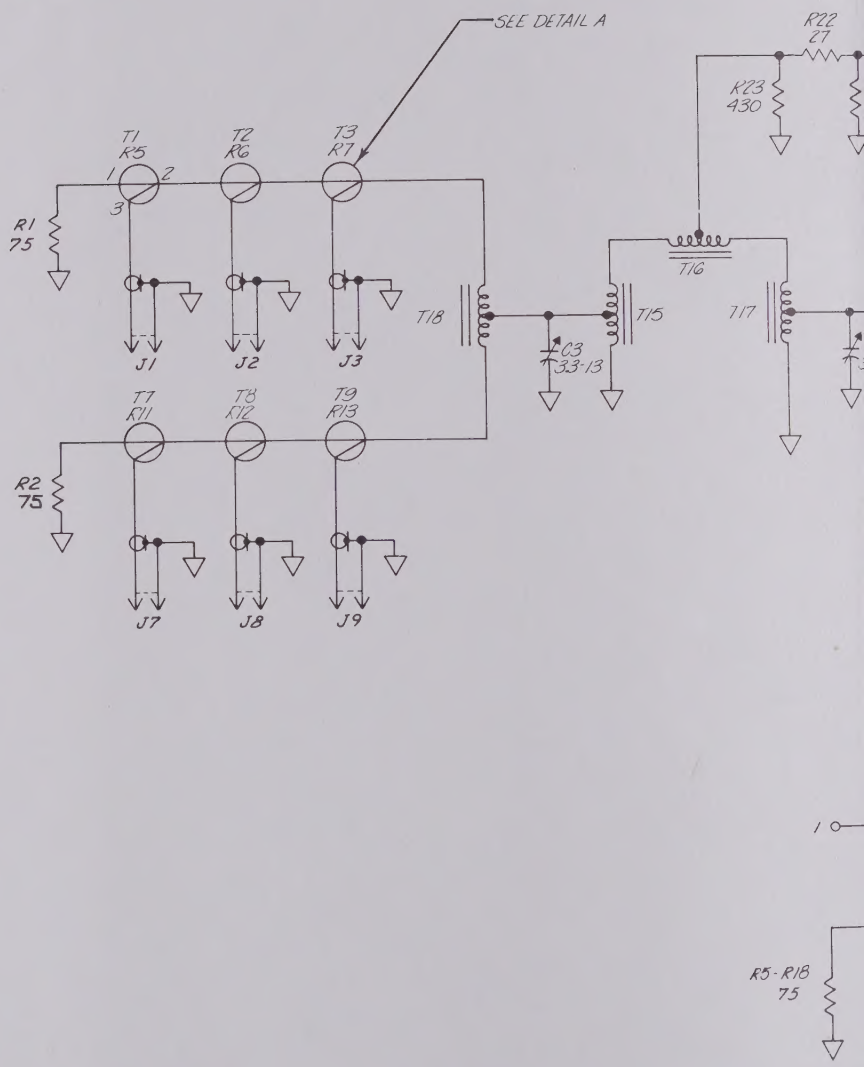


Figure 7-5. Model 68-12TS Combining Network, Printed Wiring Board, Component Location



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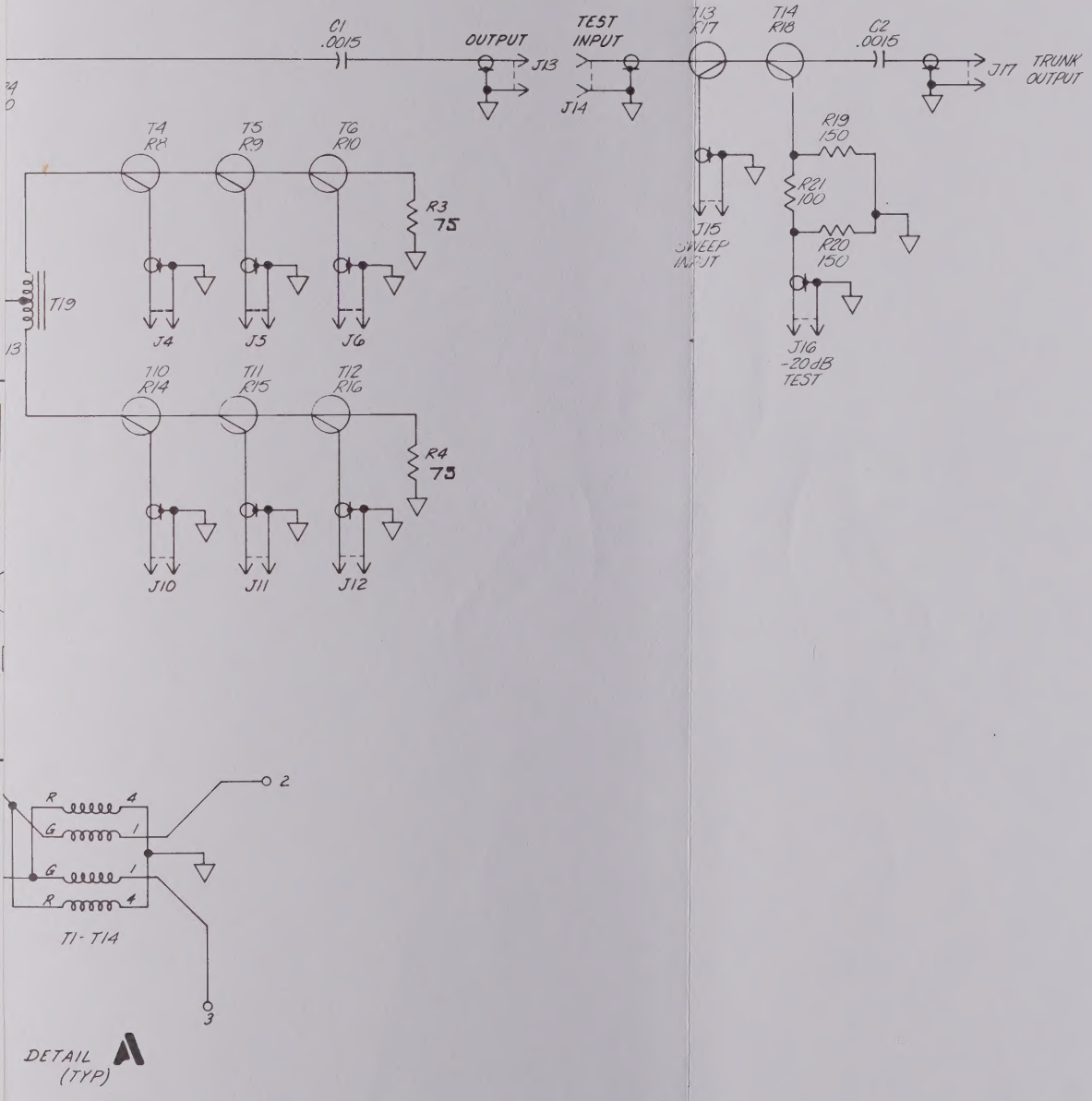

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Figure 7-6. Model 68-12TS Combining Network, Printed Wiring Board, Schematic Diagram

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